Attorney Docket No. 20 01 0487

## Remarks

Claims 1-40 remain in the application.

The specification has been amended to include headings in accordance with US practice.

The Abstract of the Disclosure has been amended to comply with MPEP 608.01(b).

Claims 1 through 40 have been amended to eliminate reference numbers, multiple dependencies, and the phrase "the steps of." As such, claims 1 through 40 have been clarified by amendment for purposes of form. It is respectfully submitted that the amendments to claims 1 through 40 are neither narrowing nor made for substantial reasons related to patentablity as defined by the Court of Appeals for the Federal Circuit (CAFC) in Festo Corporation v. Shoketsu Kinzoku Kogyo Kabushiki Co., Ltd., 95-1066 (Fed. Cir. 2000). Therefore, the amendments to claims 1 through 40 do not create prosecution history estoppel and, as such, the doctrine of equivalents is available for all of the elements of claims 1 and 4. Accordingly, it is respectfully submitted that claims 1 through 40, as amended, are allowable.

Consideration and allowance of application is respectfully requested.

Attached hereto is a marked up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "Version With Markings to Show Changes Made."

Respectfully submitted,

1-29-02
Date

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Attorney Docket No.: [illegible]01 0487

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In The Specification

Please amend the specification as follows:

On page 1, between lines 2 and 3, insert -- 1. Field of the Invention --.

On page 1, between lines 7 and 8, insert --2. Discussion of the Background Art --.

In The Abstract

Please amend the abstract as follows:

ABSTRACT OF THE DISCLOSURE

A method of determination of a property of an optical device under test[, comprising the steps of:] includes, using a first initial coherent light beam, changing a first initial property of the first initial light beam, coupling the first initial light beam to the device under test, detecting a first signal of the first initial light beam received from the device under test, and correcting any a non-linearity in the first signal by interpolating the first signal on a linear scale.

[[Fig. 2 for publication]]



In The Claims

Please amend the claims as follows:

1. (Amended) A method of determination of a property of an optical device under test [(12)], comprising [the steps of]:

[-] using a first initial coherent light beam [(20)],

[-] changing a first initial property of the first initial light beam [(20)],

[-] coupling the first initial light beam [(20)] to the device under test [(12)],

[-] detecting a first signal of the first initial light beam [(20)] received from the device under test [(12)], and

[-] correcting a non-linearity in the first signal caused by a non-linearity in the change of the first initial property by interpolating the first signal on a linear scale.

2. (Amended) The method of claim 1, further comprising [the steps of]:

[-] using a second initial coherent light beam [(22)],

[-] changing a second initial property of the second initial light beam [(22)],

[-] detecting a second signal of the second initial light beam [(22)] without coupling it to the device under test [(12)], to discover a non-linearity in the second signal caused by a non-linearity in the change of the second initial property, and

[-] using the discovered non-linearity of the detected second signal to interpolate the first signal.

3. (Amended) The method of claim 1, further comprising [the steps of]:

[-] producing a coherent light beam [(16)], and

[-] splitting the coherent light beam [(16)] into a first initial light beam [(20)] and a second initial light beam [(22)].

4. (Amended) The method of claim 1, further comprising [the steps of:

-] detecting the first resulting property simultaneously with the second resulting property.

5. (Amended) The method of claim 1, further comprising

[-] changing the first initial property simultaneously with the second initial property.

6. (Amended) The method of claim 1,

wherein the first initial property and the second initial property [being] are the same initial property.

7. (Amended) The method of claim 1,

wherein the initial property [being] is the frequency of the coherent light beam [(16)].

8. (Amended) The method of claim 1, further comprising [the steps of]:

[-] transforming the first signal in a number of phase signals over a linear scale of a number of points of time,

[-] transforming the second signal in a number of frequency signals over the same linear scale of points of time to discover a non-linearity in the second signal caused by a non-linearity in the change of the initial property, the initial property being the frequency of the coherent light,

[-] assigning the transformed first signal to the transformed second signal, and

[-] interpolating the assigned transformed first signal on a linear scale of frequencies.

9. (Amended) The method of claim 8, further comprising [the steps of:

-] creating the linear scale of frequencies $f_{lin}(n)$ according to the formula

$f_{lin}(n) = (f_{min} - f_{max}) \times (n/N)$, n Element 1,..., N, N being the number of points of time.

10. (Amended) The method of claim 1, further comprising [the steps of]:

[-] splitting the first initial light beam [(20)] into a first light beam [(26)] and a second light beam [(28)],

[-] coupling the first light beam [(26)] to the optical device under test [(12)],

[-] letting the second light beam [(28)] travel a different path as the first light beam [(26)],

[-] superimposing the first [(26)] and the second [(28)] light beam to produce interference between the first light beam [(26)] and the second light beam [(28)] in a resulting first superimposed light beam [(36)],

[-] detecting as a first signal the power of the first superimposed light beam [(36)] as a function of time when tuning the frequency of the coherent light beam [(16)] from a minimum to a maximum of a given frequency range in a given time interval,

[-] splitting the second initial light [(22)] beam in a third light beam [(48)] and a fourth light beam [(50)],

[-] superimposing the third light beam [(48)] and the fourth light beam [(50)] after each light beam [(48, 50)] has traveled a different path, to produce interference between the third [(48)] and the fourth [(50)] light beam in a resulting second superimposed light beam [(56)],

[-] detecting as a second signal the power of the resulting second superimposed light beam [(56)] as a function of time when tuning the frequency of the coherent light beam [(16)] from a maximum to a minimum of a given frequency range in a given time interval,

[-] using the detected second signal for deriving a non-linearity information about a non-linearity in a tuning gradient of the frequency when tuning the frequency of the coherent light beam [(16)] from the maximum to the minimum of the given frequency range, and

[-] using the non-linearity information for correcting effects on the first signal caused by the non-linearity to get a corrected first signal [(108)].

11. (Amended) The method of claim 1, further comprising [the steps of:

-] deriving the non-linearity information by:

[-] transforming the second signal to get a Fourier transformed second signal,

[-] eliminating the negative parts of the Fourier transformed second signal to get a non-negative Fourier transformed second signal,

[-] retransforming the non-negative Fourier transformed second signal to get an analytic signal of the second signal,

[-] determining the phase of the analytic signal to get as a second phase signal the phase as a function of time of the second signal, and

[-] using the second phase signal for determining as the non-linearity information the frequency as a function of time of the second signal.

12. (Amended) The method of claim 1, further comprising [the steps of:

-] deriving a first phase signal by:

[-] transforming the first signal to get a Fourier transformed first signal,

[-] eliminating the negative parts of the Fourier transformed first signal to get a non-negative Fourier transformed first signal,

[-] retransforming the non-negative Fourier transformed first signal to get an analytic signal of the first signal, and

[-] determining the phase of the analytic signal to get as a first phase signal as a function of time of the first signal.

13. (Amended) The method of claim 1, further comprising [the steps of:

-] correcting the effects on the first signal caused by the non-linearity by:

[-] using the non-linearity information to interpolate the first phase signal of the first signal on a linear scale of frequencies to get a corrected first phase signal.

14. (Amended) The method of claim 1, further comprising [the steps of:

-] determining the frequency f(n) of the second signal as a function of n discrete points of time, n= 1, ..., N, on the basis of the second phase signal to determine the non-linearity information by:

~~[-] determining the second phase signal $\phi(n)$ at the n points of time,~~

[-] determining the maximum $\phi_{max}$ of the second phase signal, and

[-] using a predetermined maximum frequency $f_{max}$ of the frequency range, a predetermined average tuning velocity during tuning the frequency and the maximum $\phi_{max}$ of the second phase signal to determine for each of the n points of time the frequency f(n) according to the formula: $f(n)=[(f_{max}-f_{min})/\phi_{max}]\phi(n)$.

15. (Amended) The method of claim 1, further comprising [the steps of:

-] getting the linear scale $f_{lin}(n)$ of frequencies by:

[-] using the predetermined maximum frequency $f_{max}$ of the frequency range and the predetermined minimum frequency $f_{min}$ of the frequency range to determine the linear scale $f_{lin}(n)$ of frequencies according to the formula: $f_{lin}(n)=[(f_{max}-f_{min})/(N-1)]n$, and

[- preferably] sorting the absolute values of f(n) monotonically.

16. (Amended) The method of claim 1, further comprising [the steps of:

-] using f(n) for interpolating the first phase signal of the first signal on the linear scale of frequencies $f_{lin}(n)$.

17. (Amended) The method of claim 1, further comprising [the steps of:

-] deriving transmissive and/or reflective properties of the optical device under test from the compensated first signal.

18. (Amended) The method of claim 1, further comprising at least one of the following [steps of]:

[-] deriving a group delay [(112)] of the optical device under test [(12)] as a function of frequency from the corrected first signal [(108)], and

[-] deriving the chromatic dispersion coefficient of the optical device ~~under test [(12)] as a function of frequency from the corrected first signal~~ [(108)].

19. (Amended) The method of claim 1, further comprising [the steps of:

-] deriving a group delay [(112)] of the optical device under test [(12)] by differentiating the corrected first phase signal with respect to the frequency.

20. (Amended) The method of claim 1, further comprising [the steps of:

-] ignoring at the begin of the tuning a predetermined amount of values of the corrected first phase signal to eliminate teething troubles out of the corrected first signal [(108)].

21. (Amended) The method of claim 1, further comprising [the steps of]:

[-] approximating the group delay [(112)] with polynoms of at least second order to get an approximated group delay, and

[-] subtracting the approximated group delay from the group delay [(112)] to get a non-linear part of the group delay [(112)].

22. (Amended) The method of claim 1, further comprising [the steps of:

-] using the non-linear part of the group delay to determine the mean signal power of a deviation from a linear group delay of the device under

test [(12)].

23. (Amended) The method of claim 1, further comprising [the steps of:

-] using the square coefficient of the polynomial to determine the mean gradient of the group delay [(112)].

24. (Amended) The method of claim 1, further comprising [the steps of:

-] making the first signal oscillating about a zero line by:

~~[-] determining the points of mean value of the first signal,~~

[-] interpolating a curve through these points, and

[-] subtracting the values of the curve from the first signal to get a corrected first signal oscillating about the zero line.

25. (Amended) The method of claim 1, further comprising [the steps of:

-] determining the points of mean value by extracting all points with a maximum gradient.

26. (Amended) The method of claim 1, further comprising [the steps of:

-] making the first signal oscillating about a zero line by[:

-] determining the points of mean value of the first signal by:

[-] determining the maximum and the minimum of the first signal in a predetermined first range of time smaller than the total range of time,

[-] determining a mean value between the maximum and the minimum,

[-] determining the maximum and the minimum of the first signal in a predetermined next range of time adjacent the already examined range of time,

[-] determining a mean value between the maximum and the minimum,

and

[-] repeating the last two steps until the complete time interval is covered.

27. (Amended) The method of claim 1, further comprising [the steps of:

-] choosing the predetermined range of time by:

[-] determining the average period of the oscillations of the first signal, and

~~[-] choosing the size of the range so that more than two average periods~~ fit in the chosen range of time.

28. (Amended) The method of claim 1, further comprising [the steps of:

-] determining the points of mean value by:

[-] determining the maximum of the Fourier transformed signal of the first signal,

[-] using the maximum to determine a size of a high-pass filter, and

[-] filtering the Fourier transformed first signal with the high-pass filter.

29. (Amended) A method of determination of a property of an optical device under test [(12)], comprising [the steps of]:

[-] detecting a change of a signal with time, being the basis for deriving the property, and

[-] filtering the detected signal by:

[-] transforming the detected signal to get a Fourier transformed signal,

[-] filtering the Fourier transformed signal with a filter to get a filtered Fourier transformed signal,

[-] retransforming the filtered Fourier transformed signal to get a filtered

signal, and

[-] deriving the property on the basis of the filtered signal.

30. (Amended) The method of claim 29, further comprising [the steps of:

-] correcting the detected signal [being corrected] for a non-linearity [by the method of claim 1] to get a corrected first signal [(108)] by:

using a first initial coherent light beam,

changing a first initial property of the first initial light beam,

coupling the first initial light beam to the device under test,

detecting a first signal of the first initial light beam received from the device under test, and

correcting a non-linearity in the first signal caused by a non-linearity in the change of the first initial property by interpolating the first signal on a linear scale.

31. (Amended) The method of [any one of the claims 1-30] claim 12, further comprising [the steps of]:

[-] using the corrected first signal to calculate the corrected first phase signal versus frequency,

[-] filtering the corrected first phase signal by[:

-] Hilbert transforming it before filtering it to get a corrected signal to be filtered [according to the steps of any one of the claims 29 or 30] by detecting a change of a signal with time, being the basis for deriving the property, and

[-] filtering the detected signal by transforming the detected signal to get a Fourier transformed signal, filtering the Fourier transformed signal with a filter to get a filtered Fourier transformed signal, retransforming the filtered

Fourier transformed signal to get a filtered signal, and deriving the property on the basis of the filtered signal.

32. (Amended) The method of claim 1, further comprising [the steps of:

-] filtering the corrected first signal [(108)] before calculating the group delay [(112)].

33. (Amended) The method of claim 1, further comprising [the steps of:

-] adapting the filtering to the shape of the corrected first signal [(108)] by:

[- a:] making an interferometric signal out of the corrected first phase signal,

[- b:] Fourier transforming the interferometric signal to get a spectral signal,

[- c:] determining a fraction[, preferred the half,] of the maximum of the spectral signal,

[- d:] determining the abscissas of the intersections of the ordinate of the fraction with the curve of the spectral signal,

[- e:] determining the mean frequency $f_{mean}$ as the average of the abscissas, and

[- f:] band-pass filtering the spectral signal with a band-pass filter having its center at the mean frequency and having a width greater than the width of the frequency range.

34. (Amended) The method of claim 1, further comprising [the steps of:

-] determining the width of the band-pass filter by:

[- a:] predetermining or estimating the maximal range $GD_{range}$ of the group delay,

[- b:] determining the mean value $GD_{mean}$ of the group delay [according to the steps c-e of claim 33,] by determining a fraction of the maximum of the spectral signal, determining the abscissas of the intersections of the ordinate of the fraction with the curve of the spectral signal, and determining the mean frequency $f_{mean}$ as the average of the abscissas, and

[- c:] calculating the filter width according to the formula: filter width= $f_{mean}(GD_{range}/GD_{mean})$.

35. (Amended) The method of claim 1, further comprising [the steps of]:

[-] subtracting a gradient in the group delay from the group delay,

[-] predetermining the maximum range $GD_{range}$ of the group delay,

[- performing the steps b and c of claim 34,] determining the mean value $GD_{mean}$ of the group delay by determining a fraction of the maximum of the spectral signal, determining the abscissas of the intersections of the ordinate of the fraction with the curve of the spectral signal, and determining the mean frequency $f_{mean}$ as the average of the abscissas,

calculating the filter width according to the formula: filter width= $f_{mean}(GD_{range}/GD_{mean})$,

[-] calculating the group delay, and

[-] adding the subtracted gradient to the calculated group delay.

36. (Amended) A software program or product[, preferably stored on a data carrier,] for executing [the] a method [of claim 1] for determining a property of an optical device under test, when run on a data processing system [such as a computer] , said method comprising:

using a first initial coherent light beam,

changing a first initial property of the first initial light beam,

coupling the first initial light beam to the device under test,

detecting a first signal of the first initial light beam received from the device under test, and

correcting a non-linearity in the first signal caused by a non-linearity in the change of the first initial property by interpolating the first signal on a linear scale.

37. (Amended) An apparatus of determination of properties of an optical device under test, comprising:

[-] a first beam splitter [(18)] in a path of a coherent light beam [(16)] for splitting the coherent light beam [(16)] into a first initial light beam [(20)] traveling a first initial path and into a second initial light beam [(22)] traveling a second initial path,

[-] a second beam splitter [(24)] in that first initial path for splitting the first initial light beam [(20)] into a first light beam [(26)] and traveling a first path [(32)] and into a second light beam [(28)] traveling a second path,

[-] a place in that first path [(32)] for coupling the first light beam [(26)] to the optical device under test [(12)],

[-] a third beam splitter [(34)] in that first [(32)] and in that second path for superimposing the first [(26)] and the second [(28)] light beam after the second light beam [(28)] has traveled a different path as the first light beam [(26)] to produce interference between the first light beam [(26)] and the second light beam [(28)] in a resulting first superimposed light beam [(36)] traveling a first resulting path,

[-] a first power detector [(38)] for continuously detecting as a first signal the power of the first superimposed light beam [(36)] as a function of time when tuning the frequency of the coherent light beam [(16)] from a minimum to a maximum of a given frequency range in a given time

interval,

[-] a fourth beam splitter [(46)] for splitting the second initial beam [(22)] in a third light beam [(48)] traveling a third a path and a fourth light beam [(50)] traveling a fourth path,

[-] a fifth beam splitter [(54)] in that third and in that fourth path for superimposing the third light beam [(48)] and the fourth light beam [(50)] after each light beam [(48, 50)] has traveled a different path, to produce interference between the third [(48)] and the fourth light beam [(50)] in a resulting second superimposed light beam [(56)] traveling a second a resulting path,

[-] a second power detector [(60)] for continuously detecting as a second signal the power of the resulting second superimposed light beam [(56)] as a function of time when tuning the frequency of the coherent light beam [(16)] from a maximum to a minimum of a given frequency range in a given time interval, and

[-] an evaluation unit [(44)] for deriving optical properties of the optical device under test [(12)], for using the detected second signal for deriving a non-linearity information about a non-linearity in a tuning gradient of the frequency when tuning the frequency of the coherent light beam [(16)] from the maximum to minimum of the given frequency range, and for using the non-linearity information for correcting effects on the first signal caused by the non-linearity to get a corrected first signal.

38. (Amended) The apparatus of claim 37,

further having computing means [capable of performing a least one of the further steps according to any of the claims 2-36] for:

using a first initial coherent light beam,

changing a first initial property of the first initial light beam,

coupling the first initial light beam to the device under test,

detecting a first signal of the first initial light beam received from the device under test [(12)],

correcting a non-linearity in the first signal caused by a non-linearity in the change of the first initial property by interpolating the first signal on a linear scale,

and at least one of:

using a second initial coherent light beam,

changing a second initial property of the second initial light beam,

detecting a second signal of the second initial light beam without coupling it to the device under test, to discover a non-linearity in the second signal caused by a non-linearity in the change of the second initial property, and

using the discovered non-linearity of the detected second signal to interpolate the first signal.



39. (Amended) The apparatus of claim 37, further comprising[:]

a circulator [(52)] at that place in that first path [(32)] to enable the apparatus [(10)] to examine reflective optical components also.

40. (Amended) The apparatus of claim 37,

[where] wherein the second beam splitter [(24)], the third beam splitter [(34)] and the first detector [(38)] build up a first Mach-Zehnder interferometer,

and wherein the fourth beam splitter [(46)] and the fifth beam splitter [(54)] and the second detector [(58)] build up a second Mach-Zehnder interferometer.